

SCIENCE.

FRIDAY, NOVEMBER 12, 1886.

COMMENT AND CRITICISM.

THE EXERCISES which have just been concluded at Cambridge are memorable. Age is not that of which we can usually boast in this country, but it is a source of genuine pride to be able to chronicle the celebration of the two hundred and fiftieth anniversary of our oldest and greatest university. Founded when the colony was yet a child, Harvard has grown with the nation's growth. From a provincial theological training-school in 1636, living on a colonial grant of four hundred pounds (increased in 1638 by the bequest of John Harvard), it has become in 1886 a many-sided university, expending the annual income of five millions of dollars; and even now its abilities do not keep pace with its desires and its opportunities. Its past and its present, and we trust its future too, are linked with all that is great and noble in our country's history. This splendid story has been fitly told and commemorated during the formal celebration by the chosen orators and poets, and as Harvard enters on her new quarter-millennium the good wishes of the country are with her. May she ever hold her place in the front rank of our great educational institutions.

THE MOVEMENT IN FAVOR of appointing women as members of the board of education in New York city is gaining force, and the prevailing belief is that it will be successful. It is reported, with how much accuracy we do not know, that New York, Brooklyn, and Buffalo are the only cities in New York state that have no female representatives on the school-boards, and Mayor Grace is said to be inclined to favor the new departure. The whole matter is in his hands, for he will shortly have the appointment of successors to the outgoing members of the present board. We fancy that the principal obstacles in the way of the innovation will be political rather than sentimental. It is hardly probable that any of the members whose terms are about to expire will want to be set aside; and even if they should so desire, there are plenty of male candidates, as is usual in New York city, for the places thus

made vacant. Under the circumstances Mayor Grace's position is a difficult one, but great pressure is being brought to bear upon him to appoint at least one woman to a vacancy. Numerous petitions to that effect are in circulation, and they are being signed by the most intelligent and influential class of citizens. A large proportion of the female teachers have signed these petitions, and among the host of prominent names appended to them we have noticed those of the president and a large number of the faculty of Columbia college, such clergymen as Bishop Henry C. Potter, Dr. Henry Y. Satterlee, Dr. Howard Crosby, Father McGlynn, and Rev. Heber Newton, and men like William E. Dodge, Senator Evarts, Felix Adler, Joseph H. Choate, and Charles A. Dana.

THE CITY OF HAMILTON, Ontario, has a prosperous society, the Hamilton association, devoted to philosophical and scientific studies, which has lately issued a respectable collection of Proceedings. Besides the inaugural address of the president, the leading papers are: 'On birds and bird matters,' by Thomas McIlwraith; on 'Early Greek philosophy,' by the Rev. I. W. A. Stewart; on 'A remarkable land-slide near Brantford, Ontario,' by J. W. Spenser; on 'Burlington Bay and the city drainage,' by C. S. Chittenden; on 'Race identity of the old and new worlds,' by William Glyndon; on 'The early home, separation, and re-union of the Aryan family,' by the Rev. E. L. Laidlaw; and on 'Some evidences of commercial transactions in prehistoric times,' by William Kennedy. These are all well-written and scholarly papers, evincing much learning and thought. Unfortunately, with the exception of those of Messrs. McIlwraith, Spenser, and Chittenden, none of them are based on original observation, or add anything to the world's stock of knowledge. Hamilton, near an important dividing-line of formations and climate, is singularly well situated for the study of geology and the biological sciences. It was also, not long ago, a noted centre of the Indian tribes, and some fragments of these still remain in the neighborhood. Its district, therefore, offers a particularly inviting field for the study of American archeology and ethnology. It

is disappointing to find that these advantages have been so little utilized by an association numbering evidently members of marked ability. They will do well to bear in mind, that, in the publications of a scientific association, one paragraph describing the results of original investigation is likely to be worth more than many pages of compilation.

DR. WILLIAM A. HAMMOND has been amusing a medical association with some humorous accounts of his experience with cocaine. He is reported to have said that there is no danger of the formation of a cocaine habit. Dr. Hughes, writing in the *Medical review*, takes a different view, and in his summing-up claims that cocaine is a tonic and stimulating exhilarant of considerable power in melancholia, mental depression, and nerve weariness, being more rapid and at the same time more evanescent in its action than morphia. He distinctly says, moreover, that, when used to excess, it intoxicates, and converts melancholia into mania, and that its continuous use is difficult to break off; that it is a dangerous therapeutic toy, and ought not to be used as a sensational play thing; that it will probably help to fill rather than to deplete the asylums, both inebriate and insane, if it should come into as general use as the other intoxicants of its class; that as an intoxicant it is more dangerous, if continuously given, than alcohol or opium, and more difficult to abandon.

THE FRIENDS OF TECHNICAL education in the New York public schools are evidently not permitting themselves to be discouraged by the disposition by the board of education of the special committee's report on that subject, of which mention was made in *Science* (viii. No. 195) at the time. At the meeting of the board of education last week, a communication was received from the Industrial education association, of which Gen. Alexander S. Webb is president, and Miss Grace H. Dodge vice-president, offering to make a practical test of the value of instruction in certain branches of manual labor, by giving instruction to a number of public-school children this year during school hours and under school discipline. The number of pupils that can be accommodated by the association in their building at No. 21 University Place is, in industrial drawing and modelling, forty; in carpentry, twenty-four; in sewing, forty; in cooking, forty-

eight; in domestic economy, three hundred. In addition to this offer, it was stated that a series of lectures on industrial education is to be given at an early date, and will be open to public-school teachers. The proposition of the association is a generous one, and will serve admirably for a beginning in this important matter. We trust that the committee on the course of studies, to which the communication was referred, will recommend that the offer be accepted, and the necessary arrangements made for carrying it out.

WE HAVE POINTED OUT from time to time the important bearing that the study of local institutions has on historical science in general, and have found frequent evidence of a growing appreciation of this fact. To be sure, the best of things may be carried to excess, and this probably has given rise to the complaints that have been made by some critics, that this 'history of the town-pump business' is being overdone. We believe, however, that such critics are mistaken, and forget that the chroniclers of the fortunes of the town-pump are not writing a history in the broad sense of the word, but are furnishing accurate data for wide-reaching historical generalizations. A recent reviewer in the *Athenaeum*, writing of Mr. Gomme's book on 'The literature of local institutions,' may be quoted as giving evidence on this point. He says that Mr. Gomme holds the opinion that many of the English boroughs existed long before their earliest charters, which were royal confirmations of existing customs, not the creation of something new. "This, in our opinion," he continues, "does not admit of doubt. The battle now rages between those who hold them to be survivals from the time of the Roman occupation, and a strong and learned body who affirm that the evidence we have points in most cases, though not in all, to their being of Teutonic origin. We feel assured"—this is the significant sentence for our purpose—"that, if all corporation and manorial documents were made accessible, the war would soon come to an end."

A CIRCULAR from Prof. Geo. H. Cook, state geologist of New Jersey, announces the formation there of a state weather service, after the kind of those already existing in other parts of the country. Two hundred volunteers are desired: they will be supplied with forms for records, and with certain publications of the signal office. Instru-

ments have to be, for the present at least, bought by the observer. In the list of prices, the rain-gauge is marked at \$1.25, and we doubt whether it can be of desirable accuracy at so low a price. It is strange that states as advanced as New York and Pennsylvania do not join their neighbors in meteorological work.

THE EXPERIMENT of making optional the attendance at the daily chapel service at Harvard college is being watched with interest by college authorities all over the country. Professor Peabody, the Plummer professor of Christian morals, and his five coadjutors, took charge of the chapel service on Oct. 3, under the new regulations; and now Dr. D. G. Lyon, Hollis professor of divinity at Harvard, writing in last week's *Independent*, tells of the new plan and its results so far as they have already been developed. The chapel services are more interesting and more inspiring than they ever were, for now no student attends who does not go from choice. The average attendance is between 400 and 450, as against about 600 under the compulsory system, but the gain in force and spirituality is enormous. Professor Lyon assures us that so far the predictions of the conservative party, which opposed the change, remain unfulfilled, and he firmly believes that they will remain so.

A RECENT NEWSPAPER REPORT (*Chicago journal*, Oct. 26) tells the story of a remarkable case of fracture of the spine and cord. Mr. Andrew Hamilton was 'coaching' some college men in the gymnasium, and, while showing some simple performance on a low cross-bar, dropped about four or five feet on the mattress. By some peculiar wrenching of the neck, he cracked the fifth cervical bone and compressed the spinal cord. From that moment on, the whole of the body below the neck was completely insensible; nor could he move a single muscle, except to contract two fingers on each hand. He had to call the attendant to open the hand. He was kept alive on milk, which was poured down the mouth; and his body was supported by floating it on a rubber sheet in a tub of water. His mind was perfectly clear; he talked, read the daily papers, and even consulted his professor on reading a mathematical work. This continued for fourteen days. He then broke down, and died on the sixteenth day after the fall. It seemed hardly possible that life should continue, and the brain go on acting, if the cord were

severed, and yet the post-mortem examination showed plainly that the cord was reduced to a mass of pus.

FROM OHIO comes a report that the authorities in that state propose to construct an intermediate penitentiary to which shall be committed prisoners sentenced for the first time or for short periods, in the hope that their reformation may be effected. That this is a thoroughly practicable plan is shown by the success of the Elmira reformatory in New York state, under the efficient management of Mr. Brockway. The harm done to convicts who are imprisoned for the first time by confining them together with older and hardened criminals can hardly be estimated, and Ohio is taking a step in the right direction. Its example should be widely imitated, and probably will be when the results of the experiment are made known.

THE SEVENTH ORIENTAL CONGRESS, held at Vienna last month, was thoroughly successful, and its proceedings were deemed of sufficient interest to warrant general notice in the newspapers. The congress numbers about five hundred members, three hundred of whom were present. They came from all quarters, — Japan, China, India, Persia, Arabia, Asia Minor, Egypt, Tunis, and every country of Europe and America. Vienna is so situated that many eastern representatives could conveniently be present. The official languages of the congress were German, French, English, and Italian. Latin was permissible, and by special permission some papers were read in Arabic. The list of members of the congress comprises the names of all the great professors of oriental languages in Europe. The members from this country are not many, and among them are Professors Briggs and Brown of Union theological seminary, Haupt of Johns Hopkins university, and Dr. William Hayes Ward. The congress was divided by the committee on organization into five sections, — 1°, Semitic, which was subdivided into a section for Arabic and one for the Semitic languages other than Arabic; 2°, Aryan; 3°, African; 4°, central and east Asian; 5°, Polynesian, — of which the Aryan section was the most interesting. This section passed a resolution asking the government of India to make a thorough and systematic survey of the languages of India. By invitation of the King of Sweden the next congress will be held at Stockholm in August, 1888.

THE HEALTH OF NEW YORK DURING SEPTEMBER.

THE number of deaths which occurred in the city of New York during the month of September was 2,767, or 479 less than in the preceding month. The deaths among children under five years of age were 1,217: as compared with August, this represents a saving of 343 lives of children of this tender age. This improvement in the public health becomes still more evident if we compare September with July. In the latter the total mortality of this portion of the population mounted up to 2,499, more than double that which occurred during the former. This progressive gain is mainly to be attributed to the lower temperatures which prevail in the early autumn as compared with midsummer. In July, 240 persons died in a single day, the 8th, while the largest daily mortality of September was but 117, on the 27th. Diarrhoeal diseases claimed fewer victims by 226 than in August, and 903 less than in July. The deaths from consumption were 374, as compared with 443 in August. The September mortality from consumption was less than that of any other month of the year. Diphtheria also shows a diminution, the deaths from this cause being but 85, while in August they were 104. A similar reduction is noticeable in the deaths from scarlet-fever; 11 being recorded for September, as against 15 in August. Taken as a whole, the condition of the public health in the city of New York during the month of September was most satisfactory. That so few deaths should have been caused by such diseases as scarlet-fever and diphtheria in a population of one million and a half of people is certainly a noteworthy event.

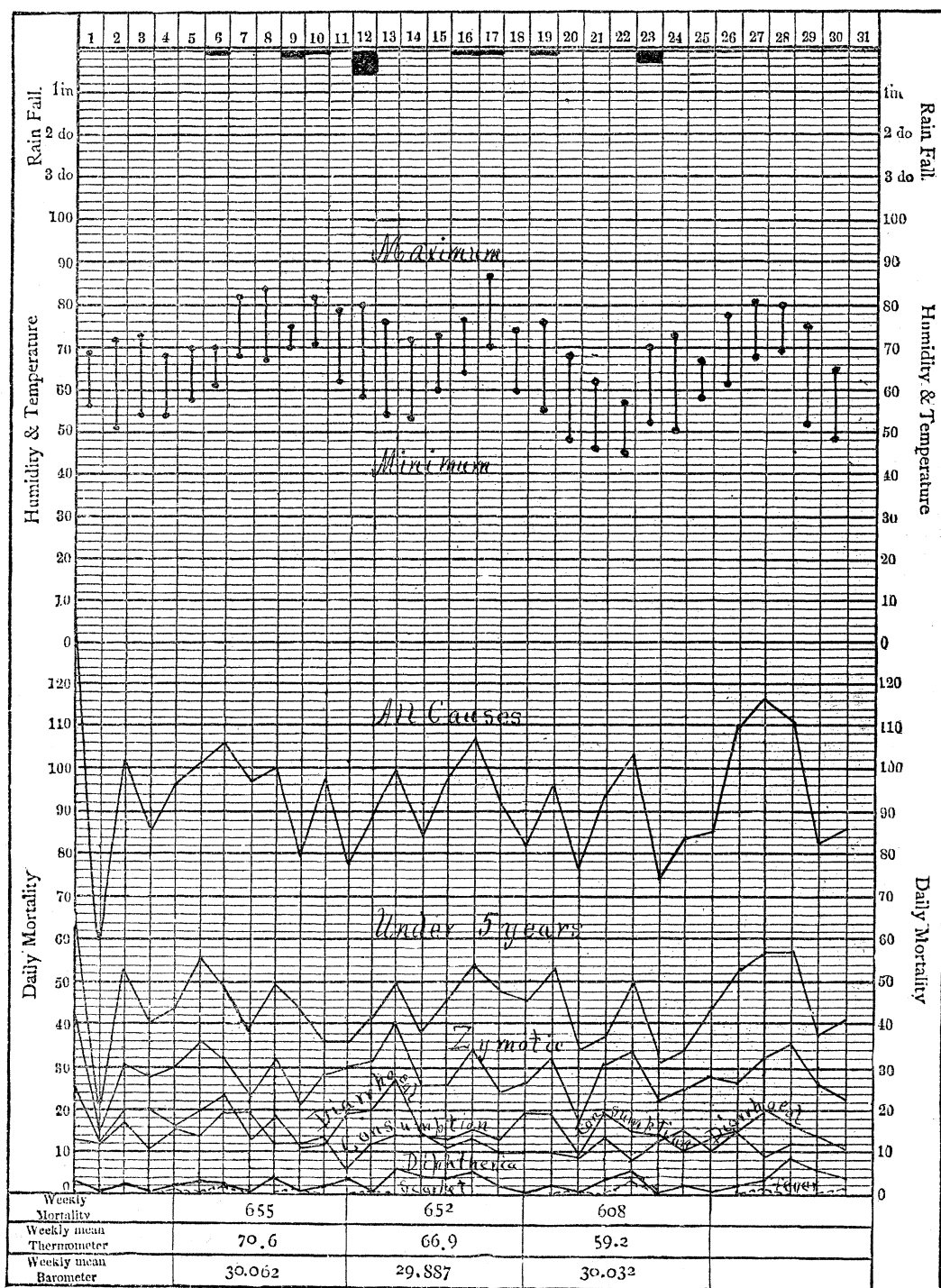
The mean temperature for the month was 65.25° F. This was below the mean for the past ten years, which was 67.04° F. The maximum reached by the mercury was 87° F., on the 17th, at 4 P.M. The average for the past decade was 88° F.; so that, so far as its temperature was concerned, September may be regarded as an average month. The rainfall during the month was but 1.17 inches. That for the corresponding month in 1885 was .41 of an inch; in 1884, .21 of an inch; and in 1881, .97 of an inch. With these exceptions, the September rainfall has not been so small since 1869 as it was this year. Indeed, the average for ten years was 3.24 inches, while in one year, 1882, 16.85 inches of rain fell in the same month. The rainfall for the month of June was 3.35 inches, a little above the average for that month during a long series of years; in July, but 2.75 inches fell, the lowest for ten years, with the exception of 1881; in August, only .95 of an inch of rain fell; and in September we had another exceed-

ingly small rainfall. The total amount of rain, therefore, which has fallen during the past three months, has been much below the average; and yet, as will be seen by a study of the records of the meteorological observatory at Central park, the rainfall for the nine months of this year, 29.10 inches, does not differ much from the average of the ten years just passed, which was 30.97 inches. The following table gives the rainfall for each of these months during the past ten years.

	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877
January.	3.91	3.06	5.22	2.68	5.08	4.80	2.02	2.63	4.46	2.62
February	4.89	4.56	4.92	4.21	3.43	4.93	2.12	2.02	3.75	1.24
March ...	2.83	.90	4.62	1.49	2.53	5.81	4.66	3.41	3.27	5.56
April	3.85	2.19	2.82	3.71	1.64	.95	2.90	4.33	1.97	2.73
May.....	5.40	1.86	3.74	2.83	4.20	3.20	.62	2.02	3.19	.95
June.....	3.35	1.32	4.98	3.32	2.52	5.35	1.14	3.15	3.08	2.80
July.....	2.75	3.59	4.74	3.21	3.21	1.25	8.53	3.58	4.62	5.73
August..	.95	5.67	7.90	1.82	1.14	.86	5.26	7.95	7.97	2.77
September..	1.17	.41	.21	3.25	16.85	.97	1.85	2.37	4.05	1.33
Total for 9 months	29.10	23.56	39.15	26.52	40.60	28.12	29.10	31.46	36.36	25.73

ACCLIMATIZATION IN NEW ZEALAND.

No country presents such a field for experiments in acclimatization as New Zealand does, and in none have the results of such experiments been so marked. Previous to Captain Cook's visits, no mammalia — with the exception of a black rat and the dogs brought by the Maoris — were to be found in these islands. That intrepid navigator gave the natives pigs, and these animals soon became wild in many places, and are still to be found in the more inaccessible parts of the colony. But they have never become so numerous as to interfere in any way with settlement, — a remark which also applies to the stray cattle and sheep which have run wild in similar regions. The native rat has long been extinct, having been completely exterminated by the common brown species, which was early introduced by ships. The latter animals are extremely abundant, not only in settled districts and towns, but even in the remotest parts. They have probably had a share in exterminating many of the ground birds, such as native quail, which are not to be found now at all. The food of those which swarm in the back country must, however, be chiefly of a vegetable nature, for they periodically migrate in great numbers. The march of settlement is



breaking up their feeding-ground in many parts, but it was not an uncommon occurrence, twenty or thirty years ago, for the traveller to come upon a huge army of rats on the march for new fields.

The most important mammalian introduction into these islands has certainly been that of the rabbit. In the southern portion of the South Island the responsibility of introducing these animals certainly rests with the Otago acclimatization society, which imported them from Tasmania in 1867. It must be said for the members of the society, that they acted in good faith, under the impression that they were doing a useful work, and little realizing what a curse their protégés were to become. Their action furnishes an illustration of the difficulty of foreseeing what effect changed conditions may produce upon any organism. Brought into a country where only a few sluggish hawks existed as natural enemies, the rabbits have increased almost without let or hinderance, and now occur in millions. Ten years ago they were almost rare: now many districts of the South Island are quite alive with them. It is impossible to realize their abundance in parts such as the Clutha valley without seeing them. The surface of the ground is honeycombed, the vegetation in places eaten nearly as bare as a macadamized road, while the animals towards evening are met with by thousands. Their effect on the stock-carrying capacity of the country has been ruinous, and their abundance has seriously retarded settlement. All sorts of devices have been tried in order to keep them down; the larger holders chiefly employing traps and dogs, and others resorting to grain poisoned by phosphorus. At considerable expense the pest is being kept in check in the populated districts; but in wild, unbroken country they multiply unchecked. The government is now trying what is generally considered to be a very dangerous experiment, viz., the liberation of weasels and stoats. If these creatures increase at all freely they will prove even a worse pest than the rabbits.

Hares, red-deer, axis-deer, and fallow-deer have been introduced by various acclimatization societies. The former are common, and are coursed regularly, but the phosphorus has nearly exterminated them in many parts. The deer are still only kept in preserves, being strictly looked after; but they are increasing steadily, and will probably furnish good sport, ere many years are past, to those who can afford the luxury of shooting them. The latest move in this direction is the proposed introduction of the chamois, as it is thought the southern Alps will be most suitable for these animals. The government has commissioned Sir Julius von Haast, who is at present in Europe, to

make inquiry for these animals at the royal preserves in Bavaria and the Austrian Tyrol.

Native birds show a tendency to disappear rapidly before the European settler. The quail, formerly so abundant as to be shot by scores, are now quite extinct, this being partly due to the introduction of rats, cats, and dogs, but chiefly to the tremendous grass fires which have swept the country from side to side, and before which all ground animals disappear like smoke. Hence the necessity was early felt by the settlers, of introducing not only game-birds, but suitable insectivorous birds. Of the former, pheasant, partridge, and California quail have become well established in many parts. In Auckland particularly, pheasants became extremely common. But in other parts the peculiar results of the rabbit question have again manifested themselves; for, in adopting the phosphorized grain-cure for rabbits, these introduced game-birds have been exterminated in whole districts. This is the case, for instance, in southern and central Otago, where ten years ago pheasants were to be seen on every hillside, and now it is rare to come across one. It is probable also, that, if weasels increase, it will be almost futile to attempt the further introduction of game-birds.

A visitor to Dunedin at the present time, strolling into the forest-clad town-belt, might see or hear a few tuis (parson-birds) or korimakos (bell-birds), but these would probably be the only native birds to be met with. But on every side he would hear the pipe of the blackbird and thrush, and see abundance of house and hedge sparrows, chaffinches, linnets, and goldfinches. In the more open ground, sky-larks would be met with in abundance, while numerous flocks of starlings would be seen busily at work in the fields. Besides these, yellow-hammers and greenfinches are common, while very recently robin-redbreasts have been liberated. In most cases the introduced birds have developed no new habits here, remaining true to their traditional instincts of robbing gardens when there was any thing worth robbing in them, but for the greater part of the year depending upon outside supplies, which are sufficiently abundant in this land of plenty. But it is difficult in many districts to get a crop of cherries or strawberries, while the farmers are annually engaged in a crusade on the small birds. The linnets, yellow-hammers, and greenfinches in particular, attack the grain-crops as soon as the young grain is well formed; and long before it is ripe, wide stretches of the fields, especially near hedgerows, are thrashed clean. This has already led to war, the farmers offering rewards for dead birds and for eggs. Whether the good these birds do

by eating insects and seeds of weeds during eleven months of the year, is balanced by the evil they do during early-harvest, is a question which has never been properly investigated. The starling is the bird whose record is most unsullied, as no one has aught but good to say about it. Immense flocks of them are now to be met with in all populated parts; and it is difficult to realize what insect devastation the country would be subject to, but for their presence. Australian magpies, minahs, and laughing jackasses have been introduced, but don't increase.

The attempts to acclimatize fish in this country have been in great part successful, though some notable failures have also been made. Several shipments of salmon ova have been made from Britain and America: in several instances all were dead on arrival in the colony. As long ago as 1874 some of these fish were successfully hatched out in the ponds on the Makarewa, a small tributary of the Oreti, and they grew well. A number of them were placed in the Aparima, a beautiful stream which flows into Foveaux Straits; but from that day to this they have never been heard of. Others were washed out of the ponds by a heavy flood, and these also have failed to put in an appearance again.

In 1878 California salmon were also turned out in large numbers in several South Island rivers, as many as 31,000 fry being liberated in two of the Otago streams; but these likewise have not been met with again. Whether they have all been destroyed or not is difficult, if not impossible, to find out. The previously introduced brown trout, the enormous indigenous eels, and the ubiquitous shags (cormorants) probably made great havoc in their ranks; but, presuming that some got away to sea, it is certainly remarkable that they do not seem to have found their way back to the rivers again. Had they done so, they would almost certainly have been met with by the numerous anglers who fish the southern streams for six months of the year. Only this year a most successful importation of Scotch salmon ova was made by the government, and young fish are now in the ponds of half a dozen of the local societies. The Otago society have about 4,000 of these. When at an age fit to turn out, it is intended to liberate all but a few hundred, which will be retained in the ponds. It is thought, that, though in opposition to their usual and instinctive habits, it may be possible to retain these fish, and breed from them in confinement. Should this prove to be the case, it will only be a question of time before the colony is well stocked with salmon.

The most remarkable results in fish acclimatization have certainly been achieved in regard to

brown trout. These fish were introduced in 1868, partly from Britain, but chiefly from Tasmania, where they had been introduced a short time previously. The rate at which they have increased in the New Zealand rivers and lakes has simply been marvellous. Fish only five years old have frequently been found to weigh from ten to fourteen pounds, while in the lakes they have reached still larger dimensions. This remarkable rate of growth appears to have been due to the fact that there was a great abundance of suitable food in the streams, and few native fish to compete with them. Of late years the size of the fish taken has not been so large, showing partly that the food-supply has fallen off, and partly that the larger fish are being caught. These ten- and twenty-pound trout are themselves the greatest destroyers of ova and young fish, and are therefore not encouraged.

To show how remarkably changes of condition may affect the fish-supply in these waters, one case may be cited. The Lea stream, a tributary of the Taieri River, and a typically perfect trout-stream, was stocked in 1869 with 98 small trout. These increased in numbers very rapidly, so that in ten years the stream was full of splendid large fish, and it became the favorite stream of Dunedin anglers. Since 1880 some 19,000 young fish have been liberated, but the fishing has gradually fallen off, and now it is difficult to get a good basket. Some attribute this to the eels, which are large and numerous; others to the shags. Both surmises are probably incorrect, as eels and shags are destroyed whenever opportunity offers, and are not apparently more abundant than they were ten years ago. The real reason seems to be, that with the enormous increase of starlings, which has already been referred to, there has been, in all parts where these birds abound, an almost total disappearance of grasshoppers and other large insects. The food-supply in the smaller streams has thus been greatly diminished, and they cannot support the number of fish they did at first.

Of late years other varieties of trout have been introduced, such as Scotch burn and Loch Leven trout. It will be an interesting study for the naturalist of the future to observe whether the varietal differences which characterize these forms will remain persistent, or whether all will revert to one common and indistinguishable type. Other fish, such as American white-fish, perch, tench, etc., have also been introduced, but up to the present they have not made any remarkable progress.

From the foregoing record of facts, it will be seen that a remarkable field of observation for

the naturalist exists in these southern isles. Fortunately, in almost every instance, the date and locality of introduction of nearly every form of animal colonist can be exactly ascertained, and by careful observation and record it will be possible to chronicle every important change. We have already seen in New Zealand the remarkable case of a fruit-eating parrot, the kea (*Nestor notabilis*), becoming a true bird of prey. Learning to pick at the skins and offal of slaughtered sheep lying about stations and stock-yards, this bird has actually acquired the art of killing sheep. So greatly has this faculty been developed, that great tracts of mountain country in the interior of the South Island are now rendered uninhabitable for the sheep. It is thought that the chamois or any other active smooth-backed animal will prove too much for the kea; but the poor sheep, with its thick matted fleece, is at the mercy of the powerful bills and claws of these birds.

Similar cases, of altered habits under altered conditions, are more likely to occur in a new country, with so peculiar an indigenous fauna as New Zealand possesses, than in any other part of the globe: hence the importance of keeping a good record from the very beginning.

GEO. M. THOMSON.

Dunedin, Oct. 8.

LONDON LETTER.

THE movement for the establishment of a British school of archeology at Athens seems in a fair way to succeed. A meeting of the general committee and subscribers to the scheme was held a day or two ago, at which it was stated that a director's house, with library and lecture-room attached, had been built at Athens, on a site presented by the Greek government. The University of Oxford, the Hellenic society, and other public bodies contributed towards the annual expenses, and Mr. F. C. Penrose was to assume the directorship of the school for one year from this present November. Among those present at the meeting were the head masters of several of the great English public schools, the minister for Greece, and other influential persons.

Several of the most distinguished medical men in London assembled at the College of physicians recently, to hear the Harveian oration (instituted by Harvey himself) pronounced by Dr. Pavy. Harvey's object in establishing this was that members of the college should 'search and study out the secrets of nature by experiment.' After referring to the bacillus, and the attack upon it by processes of disinfection, Dr. Pavy stated that another way of attacking it was due to researches

recently conducted. It had been found that the bacillus required virgin soil for its growth, and by certain means it might be brought into such a weakened state as only to occasion, when introduced into the system of an animal, an effect of a mild nature, not dangerous to life, instead of the ordinary form of disease; but the effect produced — and this was the great point of practical importance — was as protective against a subsequent attack as the fully developed disease. The knowledge recently acquired had been already practically turned to account upon a large scale for checking the ravages of that exceedingly fatal disease among cattle known as anthrax, or splenic fever; and, if that could be accomplished for one disease, — and more than one could be mentioned, — was there not ground for believing that means would be found for placing others of the class in the same position? Attempts were being made in that direction. All eyes throughout the civilized world were, indeed, fixed upon the work of Pasteur in Paris with reference to hydrophobia. Looking at the nature of the disease, there was nothing inconsistent with its being dependent upon a bacillus, or microbe as Pasteur called it. He had been an eye-witness of Pasteur's work. Judgment, it must be stated, still stands in suspense, but it must also be said that the results obtained tell decidedly in favor of the views advanced.

Two more volumes (xv. and xvi.) of the zoölogical reports of the Challenger expedition have been issued during the last few weeks; and several others may be expected within the next six months, as the treasury grant for the publication of these reports expires on the 31st of March, 1887, so that the various memoirs must be out of the printer's hands before that date.

The removal of the natural history collections from Bloomsbury to South Kensington has been accompanied by a steady increase in the publications both of the zoölogical and of the geological departments. The fossil mammalia are being catalogued by Mr. Lyddeker, formerly paleontologist to the geological survey of India; the fourth part of his work, which deals with the Proboscidea, being now in the press. Mr. R. Kidston has made a valuable contribution to paleo-botany by his catalogue of the palaeozoic plants, which is especially complete as regards the literature of the subject. The last volume issued by the geological department is the catalogue of Blastoida, which is the joint work of Mr. R. Etheridge, jun., and Dr. P. H. Carpenter, and is illustrated by twenty quarto plates. The museum contains several remarkably fine types of this class, which were collected some years ago by Messrs. Eilkertson and Rofe respectively from the carboniferous limestone of Lan-

cashire and Yorkshire, and have never been properly described; while the liberality of several American paleontologists, especially Mr. Charles Wachsmuth of Burlington, has enabled the authors to make their work a nearly complete monograph of the group. They recognize nineteen genera, which are arranged into six families, and these fall into two orders, the *Regulares* and *Irregulares*. The latter contains the singular Devonian genus *eleutheroerenies*, which was so well described by the late Dr. Shumard, together with two equally aberrant types from the carboniferous of England and Ireland respectively. These three genera differ altogether from the familiar *Pentremites* in having no trace of a stem and in the asymmetry of the calyx.

The reports recently made to the local government board by public analysts indicate in a very striking way the good effected by the adulteration act of 1875 as regards food and drugs. When public attention was first directed to this question (by the *Lancet*), one-half the samples of food analyzed were found to be adulterated. The returns for a twelvemonth, just published, show that only 13.2 per cent had been thus tampered with. The adulteration seems greatest in spirits, being 537 out of 2,321, or 23.1 per cent. Butter comes next, with 18.8 per cent. Then follow in order, coffee, mustard, and milk. The adulteration of bread has almost ceased, only 31 samples out of 1,168 tested (not 3 per cent) being faulty. Confectionery and beer are practically unadulterated, while not a single suspicious case occurred among the numerous samples of flour, sugar, pickles, tinned vegetables, jam, and wine, which were examined.

There are many signs that the electric lighting industry, so long under a cloud, has at last taken a very decided turn in the right direction, notwithstanding the fact that the removal by parliament of the legislative restrictions imposed upon it by the electric lighting act of 1882 seems as far off as ever. Numerous celebrations are projected in connection with the jubilee year of the accession of Queen Victoria, in many of which the electric light is to play a very prominent part. The battle of the patents still continues in connection with incandescent lamps, a monopoly in the manufacture of which is claimed by the Edison company, and is stoutly opposed by a number of manufacturers, headed by Messrs. Woodhouse and Rawson, who, beaten in the first trial, have appealed against the judgment of the courts, and will probably carry the matter, if necessary, up to the house of lords. That great competitor of the electric light, the gas industry, is now seriously hampered by the difficulty in disposing of its tar.

The quantity of coal carbonized for gas-making in the United Kingdom is about 8,450,000 tons per year; and if the yield of tar be taken at 12.5 gallons per ton, specific gravity 1.165, it follows that 558,780 tons of tar are annually produced. Attention, therefore, is being directed to the best conditions under which tar can be burnt as fuel; and its injection into the furnace by means of steam, with an atomizing apparatus, is found to be one of the best methods. Such 'tar-steam' evaporates 10.7 pounds of water per pound of fuel, as against from 7 to 8 pounds evaporated by 1 pound of coal.

London, Oct. 13.

W.

NOTES AND NEWS.

CORNELL university, taking up the plan outlined by President Adams last spring, will establish a law school, with a course of study extending over two years. The faculty will consist of a resident dean, a professor and an assistant professor, together with non-resident professors of special subjects. The faculty will be chosen in January, 1887, and a formal announcement of the new school will be made at that time. Cornell reports this fall 33 graduate students and 304 freshmen. The total enrollment is 794.

—Dr. Wiedermann, so long the amanuensis and pupil of von Ranke, is in an asylum near Berlin. He suffered so much from overwork on the last volume of Ranke's history, and from the nervous excitement attending the last illness and death of his master, that his mental powers became unsettled.

—The first of the Lowell free courses of lectures in Boston this winter given under the auspices of the Teachers' school of science of the Boston society of natural history, will be by Prof. W. M. Davis of Harvard college, on 'Problems in physical geography.' The program is as follows:—first and second lectures, 'Geographical classification,' illustrated by the classification of lakes according to the mode of origin of their basins; third lecture, 'Geographical evolution,' illustrated by the development of plains, plateaus, and their derivatives; fourth and fifth lectures, 'Geographical evolution, as seen in the volcanic series of geographic forms, all structures consisting of rock thrust up while molten from a deep subterranean source may be considered under this heading; the characteristic series of topographic forms developed during their wasting-away will be described. The lectures will be illustrated by maps, diagrams, and models: they will be given, as usual, in Huntington hall, at the Massachusetts institute of technology, beginning on Nov. 6.

— The council of the University of the city of New York has chosen Mr. Charles Butler to fill the office of president, made vacant by the resignation of Mr. John Taylor Johnston on account of ill health. The university has this year a total of 800 students, — 70 in the law school, 600 in the medical school, and 130 in the college proper.

— According to Prof. F. H. Snow of the University of Kansas, from observations taken at Lawrence, last month, with one exception (1879), was the warmest October in nineteen years. The rainfall was but little more than half the average, this being the fifth successive month with deficient rainfall. The total rainfall from Jan. 1 to Nov. 1 was more than two inches less than for the same period in any previous year of our record.

— Messrs. Cupples, Upham & Co., Boston, announce 'Harvard: the first American university,' by George Gary Bush, Ph.D.

— Mr. Percy Fitzgerald has just published, through Messrs. Scribner & Welford, New York, "The book fancier; or, The romance of book collecting."

— Messrs. Ticknor & Company announce for publication, on Nov. 6, 'A muramasa blade,' a story of feudalism in old Japan, by Louis Wertheimer; also monographs of American architecture, No. 4, 'The memorial hall at Harvard university,' Ware & Van Brunt, architects, 13 gelatine plates (from nature) 13x16 inches, also one photo-lithograph, in portfolio.

— *Nature* states that Messrs. Taylor and Francis of London will shortly publish a work by Mr. T. Mellard Reade, F.G.S., entitled 'The origin of mountain-ranges.' In addition to containing a systematic theory of mountain-building, with detailed experimental illustrations, the structure and geological history of the great mountain-masses of the globe will be discussed. The work will also contain many maps and sections of mountain-ranges, and a contoured map of the North Atlantic Ocean, together with numerous sketches of mountain-structure and scenery, from nature, by the author.

— At the close of the present year *Van Nostrand's engineering magazine* will pass into the hands of Mr. M. N. Forney, and be consolidated with the *Railroad journal*, which has also become the property of Mr. Forney. In January the magazine will appear in its new form, under the somewhat formidable title of the *American engineering magazine and railroad journal*. An editorial and news department will be added,

more illustrations will be given, the pages will be enlarged, and the price reduced to three dollars per year.

— An opportunity for the publication of geographic studies and monographs is offered in a series of volumes, to be entitled '*Geographische abhandlungen*,' edited by Prof. Albrecht Penck, and published by Hölzel of Vienna, — two names that insure good material and good work. The *Abhandlungen* are designed to contain essays that are too long for acceptance in *Petermann's mittheilungen* or in the Berlin *Zeitschrift für erdkunde*, unless in disjointed form, and to continue such studies as were encouraged in Kettler's *Zeitschrift für wissenschaftliche geographie*. The papers promised for this year are by Brückner, on 'The glaciation of the Salzach district;' Neumann, on 'Orometry of the Black Forest;' and Böhm, on 'The division of the eastern Alps.'

— A gold medal and money amounting to \$165 have been offered by a scientific society of Holland for the best treatise on the work of Pasteur.

— Twenty-five thousand dollars have already been expended in digging an artesian well at Northampton, Mass., and although a depth of 3,024 feet has been attained water has not been found in quantity sufficient to be of use.

— It may be cited as an evidence of the prevalence of morbid curiosity, that the first edition of Inspector Byrne's forthcoming book on the 'Professional criminals of America' has been exhausted by advance orders, and a second edition of five thousand copies is on the press.

— The death is announced of Prof. H. A. Bayne, Ph.D., of the Royal military college, Kingston, Ontario. Professor Bayne was a native of Nova Scotia, and after graduating at Dalhousie college, Halifax, studied under Liebig, Bunsen, and Dumas.

— The population of Queensland, Australia, was on the 31st of December, 1885, 326,916, of whom 191,450 were males, and 135,466 females. This is an increase of about 17,000 over the population in December, 1884.

— Dr. H. G. Beyer, U.S.N., has recently been repeating Hueppe's experiments as to the causation of lactic acid fermentation, or the process of the souring of milk. Lister believed that this was caused by a microbe, and proved it satisfactorily. Dr. Hueppe has demonstrated that there is a particular organism, described by him as bacillus lactic, which is constantly associated with lactic acid fermentation, and he has separated this organ-

ism from others. The experiments of Hueppe and Beyer appear to have demonstrated that during lactic acid fermentation the sugar of the milk is converted into lactic and carbonic acids, and that this process is directly dependent on or caused by the life and growth of a micro-organism which so differs from all others that it may properly be named *bacterium lactis*. This is a short, thick, ovoid rod, about half as broad as long, from .001 to .002 mm. in length. The germ does not liquefy gelatine. It is as yet undetermined whether it forms spores.

— Professor Cantani some months ago recommended the inhalation of a spray consisting of a pure culture of *bacterium termo* for the cure of consumption. This method of treatment was fully described in the *British medical journal* some time ago. Dr. Filipovitch of Odessa has recently tried this plan upon six cases of advanced consumption. Four of the patients died, and the other two left without having been perceptibly benefited. He came to the conclusion as the result of his personal observation that no good whatever may be expected from the treatment of tuberculosis by the inoculation of the *bacterium termo*. In one of the cases the expectoration became more profuse and offensive after the treatment was commenced, and it is questionable whether harm may not be done by inhaling these bacteria of putrefaction.

— The *Medical record* is authority for the report that Professor Windle concludes from his researches that man's original dentition included six incisors in either jaw; that two from each jaw have gradually disappeared; that this loss is due to the contraction of the anterior part of the palate; that this process of contraction will probably go on and result in the loss of two further incisors, and that the conical shape of many of the supernumerary teeth indicates a reversion to the primitive type of tooth.

— The sale of nickel-plated cooking-vessels has been prohibited in Lower Austria on the ground that vinegar and other food substances dissolve the nickel, producing a poison.

— The bacillus of bread-fermentation has been cultivated by Laurent (*Bull. acad. roy. Belg.* x. 763) and described under the name of *B. panificus*. The spores are found on the surface of grain and remain in the flour when ground. They develop rapidly in dough, as well as in gelatine, saccharose, and boiled starch, and are capable of withstanding the temperature of boiling water, when not situated within a half inch of the surface of the bread while cooking. The bacilli occur richly in bread,

and may be found in great numbers in the intestinal canal. In bread they may attack the starch, converting it into a substance resembling erythrodextrine, and producing a viscosity or heaviness, easily checked, however, by the addition of a quantity of an organic acid.

— Dr. W. Müller describes in *Kosmos* the remarkable habits of a Brazilian long-horn beetle (*Oncideres*) of less than an inch in length, which gnaws off branches, from one to two inches in diameter, of the hard-wooded camphor-tree, for the purpose of inserting its eggs into the twigs, which is done after the branches have fallen to the ground.

— A successful attempt at crossing wheat and rye is mentioned in Biedermann's *Centralblatt*. The grain capsules of the wheat were carefully opened, and the stamens removed before they were developed. The pollen from the rye was afterwards placed upon the stigmas, and the whole head carefully tied up. The seeds resulting from this process were planted and readily germinated, producing plants that partook of the characters of both parent forms, though with those of the wheat predominating. Some of the ears had long glumes, while others had short ones. The seeds themselves showed a resemblance to rye, but less than to wheat.

— A strange effect of light transmitted through a solution of sulphate of quinine upon the blossoming of plants has been made known by Sachs. From a series of experiments he has shown that plants germinated and grown under the influence of such light, while thriving otherwise, develop only small, imperfect, and speedily perishable flowers. Light transmitted in a similar way through pure water impaired in no way the blossoming powers.

— Since the discovery of the independence of the physiological senses of heat, pain, cold, and touch, a special interest has attached to the ascertainment of the different ways in which these sensations are transmitted to the brain. Professor Herzen has recently shown (*Arch. sc. phys. et nat.* xv. 580), from vivisectional experiments, the intimate relation between cold and touch, and that an injury to the cortex of the brain that destroys the sense of touch in any region will usually also abolish correspondingly the sense of cold. Accidentally, however, in one case, through cutting less deep than he had intended, he found that the sense of cold was abolished while that of touch remained uninjured, proving the ultimate distinction between the brain centres of these two senses.

—Dr. M. J. Roberts of New York, after drilling holes in bone to investigate the existence of diseased conditions, introduces a small incandescent lamp of half-candle power into the opening, and by this means illuminates the cavity.

LETTERS TO THE EDITOR.

**Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The source of the Mississippi.

THE recent discussion, in your columns and elsewhere, of the sources of the Mississippi River, must have suggested to many of your readers the thought that this is an especially fitting time to supplement and complete the work of the early explorers and the government surveyors by a careful examination of the Itasca basin in the light of all previous explorations. There are certain elements in the region that are permanent, and certain others that are temporary and will soon undergo the changes which accompany the settlement and subjection of the wilderness. The Lake Itasca of Schoolcraft and Nicollet, in the main, survives to the present day. A few years more will see many of its features changed past recognition.

If such an exploration is worth the making, it should not be long delayed; and that it is well worth making, the interest of the public already enlisted in this discussion clearly proves. Further, the fact that a mere adventurer and charlatan has been able to lead astray and befog the press and the scientific bodies of almost the entire country, east and west, is no small proof that it is desirable to settle, once for all, the questions at issue.

We have taken this view of the case ever since Captain Glazier's friends first presented his claims for our consideration. The matter was fully investigated by the head of our editorial department, and we became satisfied that nothing short of a thorough exploration of the region in question would satisfy us as educational publishers or justify us in making any changes in our geographical publications. We believe that we, as publishers of geographies and atlases which are widely used and approved, owe this much of service to the public. We therefore some weeks ago arranged to dispatch a competent exploring party to Lake Itasca, fully equipped with instruments for the complete survey and delineation of the region which supplies the feeders of the lake.

The first letters from this expedition are at hand, and consist of a general statement of the character of the work accomplished. The detailed report we expect will be forwarded to us in the course of a week or two, when we shall be glad to place them at the service of your readers as soon as the proper maps can be drawn and engraved. The following extracts from a letter before us shows the nature of the work accomplished:—

"Every stream flowing into Lake Itasca and Elk Lake was followed to its source and located. The area drained by each stream was found, as well as the volume of water discharged. The heights of land were located and elevations taken, as well as the elevation of the sources of all the streams flowing into both lakes."

We have also received by express specimens of the water from both lakes, and a number of small evergreen trees taken from Schoolcraft Island and from various points on the shores of Itasca.

Our instructions were that the exploration be

made so thorough as to satisfy every inquiry, and we believe that it has so been made.

IVISON, BLAKEMAN, TAYLOR & CO.

New York, Nov. 3.

On the figures illustrating zoological literature.

IN the course of some remarks on the figures illustrating zoological literature in *Science* for Oct. 29, Dr. R. W. Shufeldt justly pleads that proper credit be given to original authors of zoological illustrations; but in the course of his remarks he occupies considerable space in accusing me of carelessness in such matters, in the case of my 'Zoölogy' and 'First lessons in zoölogy.' I am charged with making 'a very shiftless acknowledgment of some of the authorities for the illustrations.' I am surprised at this reckless statement, as I intended to, and think I did, make full, proper, and circumstantial acknowledgment of the authorities and works from which most of the cuts were borrowed. Over two-thirds of a page of the preface is devoted to such acknowledgment, and a paragraph is given to the names of standard authors and their works. I regret to learn that two sketches drawn by Dr. Shufeldt himself were not credited. The mistake can easily be corrected in a second edition. I have prided myself on giving proper credit, on this and other occasions, to other naturalists and authors, and to those who have in other ways been of assistance.

Now, let us see if Dr. Shufeldt has been as careful, exact, and guarded as a critic should be. He lectures me for not, in my larger 'Zoölogy,' giving credit to the original artist as well as the author of the book who borrowed the figure. If Dr. Shufeldt had carefully looked through the larger 'Zoölogy,' he would have found that I had done so in the case of twenty figures (figs. 63, 75, 109, 141, 232, 279, 280, 284, 386, 387, 394, 434, 437, 457, 460, 461, 491, 500, 515, 516). Now, is this fair, candid criticism? Do not Dr. Shufeldt's sweeping statements, like those of another critic of the 'First lessons,' mislead the reader? Is such carelessness just to the author of the book?

Again: Dr. Shufeldt states that at least fourteen of the cuts from either Audubon or Wilson are accredited to Coues's 'Key.' This statement is based on an inspection of the first edition of the 'Zoölogy:' in the third and later editions, thirteen of these figures are credited to Tenney's 'Zoölogy.' Our critic should refer to the latest edition of the work with which he finds fault. It has certainly, however, been my wish to credit the figures borrowed to the original artist. It is not always easy to do so in copying from foreign works: in the case of Audubon and Wilson it could have been done, and may be in a later edition.

Coming to the 'First lessons in zoölogy,' Dr. Shufeldt charges me with ignoring the artists in a large number of figures. In the preface I say, "Of the 265 woodcuts, 111 have not appeared in the author's other books." Subtracting 111 from 265, leaves 154 figures. The sources of these are acknowledged in my two larger books; i.e., the 'Zoölogy,' and the 'Briefer zoölogy.' It seemed to me unnecessary to make the acknowledgment again in a smaller book designed for younger pupils. If this was an error, it was not from an intention to mislead. Leaving out the 154 figures previously acknowledged, then taking into account over 100 fully acknowledged, it would be easy for the critical reader to detect the eight figures

drawn by the author. Is Dr. Shufeldt's insinuation a manly one, that I would leave the students to "choose from among the most trustworthy and best of the unacknowledged ones these eight, and accredit the author with them"?

The figures after Morse, Riley, Coues, Hornaday, Rymer Jones, Owen, 'and many others,' are among the 154 previously acknowledged in my other two earlier books.

To further illustrate Dr. Shufeldt's reckless manner of writing: he remarks that fig. 212, after Graber, "looks to my mind far more like the claw of a young lobster than the head of a cockatoo." The figure is a diagram sufficiently well drawn to answer the purpose intended.

One who did not have the book before him would naturally infer, from Dr. Shufeldt's statement, that the skeleton of the wild ass was the only mammalian skeleton figured, whereas there are illustrations of those of the cow, whale, cat, bat, and walrus, with sketches of the limbs and skulls of other forms.

There are other reckless charges of 'carelessness' which seem undeserved. The 'First lessons' was not hastily written. Spare time during a period of over two years was given to its preparation. The manuscript was read, revised, and reread; some chapters were read over several times; it was also read aloud to two children of fourteen and seventeen years, to make sure that it should be intelligible. The borrowed illustrations were chosen with care: they are necessarily uneven in character, where drawn by artists of unequal ability, and copied from authors of varying merit.

In closing let me say that I believe in searching, sharp criticism of text and illustrations; it tends to greater care and accuracy: but let it be fair, manly, and ingenious; and let the critic be at least as guarded and exact in his statements as the author with whom he finds fault.

A. S. PACKARD.

Providence, Oct. 30.

The teaching of natural history.

Two works intended for 'beginners' in zoölogy have been criticised in recent numbers of *Science*, — Packard's 'First lessons in zoölogy' and French's 'Butterflies of the eastern United States.' These criticisms have been in the line of the prevailing fashion, in that the one which begins with microscopic animals, and shows such parts as can be seen only by the aid of first-class objectives, manipulated by first-class microscopists, is highly commended; while the other, which takes up animals that can be seen, and treats of parts and changes that can be observed by any student with the naked eye, is utterly condemned.

As a teacher of many years' experience with beginners in zoölogy, I hope you will let me be heard, though my remarks are not at all in the fashion.

The critic of French's work begins by saying, "The whole aim of the author seems to be to enable his reader to find out the name of a specimen in hand; and to this end his analytical key is fairly good, so far as the perfect insect goes, excepting, that as no tables are given for genera, families, etc., it would not help the student if species not included in the book were to turn up." The 'whole aim,' etc. Only 25½ pages are devoted to the key, and the book contains over 400. 'To find out the name of a specimen.' This seems, in the eyes of the fashion-

able critic, an unpardonable sin. What does any one want the name for? I can but think that there are a few good reasons for knowing the name quite early in the progress of acquaintanceship with an animal or plant: 1°, it will enable the worker to read what is already known about it, and thus know whether he has discovered anything new; 2°, if he has found out something new, he can tell or write the news, and say what he is talking or writing about; 3°, information fastened to something, be it only a name, can be kept in mind or in a note-book. The key analyzes only the 'perfect insect.' What work, either with or without a key, would enable one to determine either animals or plants at all stages? How would Coues's 'Key' or Gray's 'Manual' stand this test? For 'genera, families,' etc. The key does trace into the families, the genera, and the species; and all the families and genera are more or less fully characterized either in the key or in the body of the work. 'Species not included.' The book gives all the known species of the region: who could give the unknown ones?

I quote again from the critic. "Third, the whole aim of the author appears to be to enable the user to answer the question, 'What is the name of my butterfly?'" — for pedagogical purposes, not even a worthy, far less the best end." Of course, he had said all this before, but the 'whole' is represented by the fraction $\frac{1}{10}$. The author does not make it a 'worthy' and 'best end,' but he does make it just what it is, a worthy and best beginning; and from this good beginning he goes on to tell of its different stages of growth through egg, larva, pupa, and perfect form; of its food; and of its seasonal changes; thus helping the pupil to become a true, original investigator by discovering new facts of growth and development.

A little later in the criticism, the book is said not to contain all that has been published about every species. The critic has twice said it didn't contain anything but key. I know of no dozen works which together contain so many important facts as this one; and, on account of its size, the publisher probably had the author pay for the plates. I am thankful that he has been good enough to give this much for 'pedagogical purposes.'

The criticism is finally clinched by this remark, 'It is but the rehabilitation of the dry husks of a past generation.' If there are any dry husks in science, it is well illustrated by many of the late works for beginners in botany and zoölogy in which the classification and characterization of orders, families, etc., are given, from bacteria to a buttercup in the one, and to man in the other, — dry husks, 1°, because classification is ever changing; 2°, it is a classification of unknown things, and necessarily so, as nearly all students in schools live away from the sea, and have no chance to work with good microscopes, and more than half of classification pertains to marine and microscopic forms; 3°, such condensed classification as is possible in a 300-page book is so faulty as to be useless or worse. Take the other method for determining classification, i.e., by the use of a key. The pupil begins with something to classify, and as soon as he reaches the name of an order, family, etc., has an example to illustrate it. He knows what he is studying, and has determined by actual observation the arrangement and parts of its organs. He has been changed from a book-worm to an original observer.

Listen to a prig who says he has worked himself into a naturalist by means of the plan advocated in most of the late books on botany and zoölogy. "How did you become so great a naturalist?"—"Why, you see, when I was about twelve years old, I received a free ticket to a lecture on natural history by Professor —, and, as it was free, I of course went, and there I heard how a beginner should start. At this time I did not know the name of any animal. I properly despised those who did. I did not know a cat from a dog. When bitten, I simply cried, and ran home. I did not ask, I did not care whether it was a mosquito, a bumblebee, or a rattlesnake that bit me, or by which end I was bitten. I went home from the lecture, and purchased a compound microscope, a dissecting microscope, a set of dissecting instruments, a set of injecting instruments, a microtome, and forty bottles of hardening, staining, and mounting fluids. On account of the discounts, I was able to purchase them for two hundred dollars. Then I went and gathered some *Protomonas*, amoebae, and other protozoans, and from these I worked out the whole problem of life. I was very careful to take but little notice of the external organs, since great harm always arises from looking at outside parts. The proper way is always to begin with the insides. After this good and proper beginning, I soon became a great naturalist." This is all nonsense. No naturalist ever began in this way. As well try to make a child learn all about the letters and syllables which form a word—its root, derivation, and history, and all its prefixes and suffixes—before allowing him to use it, as to try the same plan in zoölogy. Prof. L. Agassiz said that all the great naturalists he ever knew, both in Europe and America, began their work by making and naming collections. The critic will say again 'that science had changed within the last eventful quarter-century.' Some things cannot be reversed, and this is one of them. Those who have recently had so much to say about teaching beginners are the ones who never have beginners to teach: they are university professors, with plenty of time at their command, scores of microscopes to work with, and, as students, only those who elect to take the subject because they have passed through all the necessary preliminary stages.

A TEACHER.

For what purpose mosquitoes were created.

Your mention of Dr. Finlay's view that yellow-fever may be propagated by mosquito-bites reminds me of the following: In 1839, during a yellow-fever epidemic in Augusta, Ga., no case originated at Summerville, a neighboring suburb among the sand hills. There were then no mosquitoes at Summerville, which was approached by a rather circuitous route from Augusta. Some years after, a straight, broad road was built through swamps directly to the sand hills; cisterns were also built, and mosquitoes appeared and became an intolerable pest. During the yellow-fever epidemic of 1854 a number of cases originated at the sand hills, now abounding with mosquitoes. Mosquitoes often invade sections where they were previously unknown and make permanent settlement. Mr. Mimms of Aiken, S.C., told me that the first mosquito seen in that town came from the cars on the South Carolina railroad. They are abundant there now. Dr. I. P. Garrin satisfied the medical faculty and authorities of Augusta that the yellow-fever in 1839 reached the town in freight cars

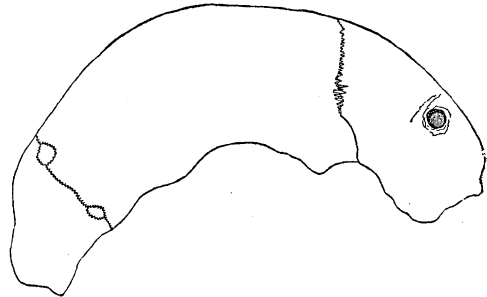
on this railroad. Dr. Roe, late of Alabama, informed me that once when quarantined for yellow-fever near Staten Island he collected a dozen or more varieties of mosquitoes from the holds of as many vessels there in quarantine from yellow-fever ports. They had evidently taken passage from the infected ports. I do not remember a locality subject to malarial fever that is not infested with mosquitoes.

HARRY HAMMOND.

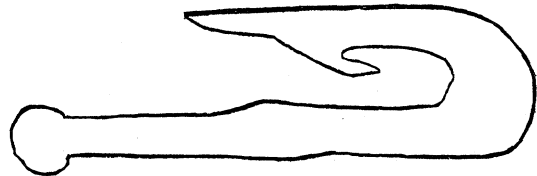
Beech Island, S.C., Nov. 3.

A long skull.

I was much struck with the very long and narrow proportions of a skull in the collection of W. W. Adams of Mapleton, N. Y., and which was exhumed with others in Cayuga county. I had not time to make a thorough examination of it, but Mr. Adams has kindly sent me a photograph, and also an outline.



The photograph shows what to him was the most interesting feature, a circular hole, of a little over a quarter of an inch in diameter, in the anterior section, which he supposed to be made by a bullet, and which was doubtless the cause of death, from its general character. The proportions interested me more, and these the photograph does not clearly show. Impressed by the elongated character of the cranium, I sent to Mr. Adams for accurate measurements, and he gives the length as eight inches, and the width four and a half. The narrowest skull mentioned in Dr. Morton's 'Crania Americana' is that of a Cayuga chief, in which the longitudinal diameter was 7.8, and the parietal 5.1; the cephalic index being 65.4. In this Cayuga skull the cephalic index would be 5.625, if the measurements are exact, as I suppose they are.



I announced some time ago my discovery of the barb of a horn fish-hook, which supplemented the figure I furnished for Dr. Rau's 'Prehistoric fishing.' It gives me pleasure to say that Mr. J. L. Twining of Copenhagen, N. Y., has another of these rare articles, found near Watertown. It closely resembles Mr. Ledyard's specimen, but is more compressed.

W. M. BEAUCHAMP.

Baldwinsville, N. Y.

SCIENCE.—SUPPLEMENT.

FRIDAY, NOVEMBER 12, 1886.

THE RELIGION OF THE UAPÉ.

HENRI COUDREAU, whose geographical work in South America has won deserved tribute, gives an interesting account of the beliefs and observances of religion among the Uapé. We have already on various occasions referred to his notes on the manners and customs of this primitive Brazilian people. Only recently has any thing been definitely known of their mythology, a subject upon which they maintain a resolute silence to the whites. The orgies called 'dabucuri' were known to have a religious significance, but beyond this little was understood of their spiritual character, if, indeed, such an adjective may be applied to them.

The Uapé religion differs, according to Coudreau, from that of any of the adjacent people. There are for them two deities, — Tupan (from *Tupá*, 'thunder') and Jurupary. The former is good or inactive, universal, vague, representing, as much as may be, the general idea of deity; while Jurupary, active, terrible, the progenitor, is the particular god of the Uapé, as Yahveh was to the ancient Hebrews. Tupan created Jurupary, who is in some sort his minister of evil. There is, however, no antagonism between them. When Tupan visits the earth, and especially the Uapé country, Jurupary accompanies him as his guide. Once upon a time there was a virgin, but with no external attributes of her sex. The people were much troubled about her, and the shamans met at her lodge, smoked, and drank the sacred liquor of a fruit called *ipadû*. Then they left her. She drank much of that which remained, and thus conceived the deity. At the proper time the infant was released by the intervention of a fish. When born, the shamans put the uncanny babe into the forest, where he grew rapidly. Light issued from his body, and when he rubbed his fingers together, sounds like thunder startled everybody.

A feast was made, at which he appeared and ordered that all should fast, or he would kill the men and boys. Some children a little later ate of fallen fruit, notwithstanding the warning. Indignant at this, Jurupary killed and ate the children. The men came together, made a feast with a great quantity of fermented fruit-juice, made the god drunk, and threw him in the fire. From his ashes grew the palms from which are made

the 'paxiuba,' or trumps, with which his devotees make their religious noises, for the sounds cannot be called music by any stretch of courtesy. During the night of his incineration, the spirit of Jurupary was able to reach heaven by the miraculous growth of the palm. Before morning, in order that the women should see no living relic of Jurupary, the men cut down the tree, and fashioned of it the first sacred pipes and other implements. The sound of them, when properly prepared, is his voice. When living on earth, he dressed in a monkey's skin: therefore the sacred mantle (to see which is death for any female) is made of monkey-skins (hence its name 'macacaraua'), and is the especial symbol of Jurupary. At first the women sounded the paxiuba and evoked the god; but one day he pursued a priestess and deprived her of the insignia of office, and ever since, death by poison in this world, and the nethermost hell in the other, has been the portion of the unfortunate woman, who, willingly or otherwise, set eyes on the insignia of the priesthood. All these events are inscribed at large on the stones of Arapapa, at Papuri.

After this time the god revealed through the shamans his regulations for the solemn exercise of his religion in feasts and flagellations, fasts and dances. The sacred mantle is made of monkey skin or hair, mixed with the hair of young girls, woven with a particular fibre. It is without sleeves, and reaches to the waist. A truncate-conical hood, with eye and mouth holes, serves as a mask. It is surmounted by a coronet of feathers, and diversely ornamented. The sacred garment is securely hidden in the shamanic repository. A profane or secular robe, sometimes called by the same name, consists of a tunic of fantastically colored bark surmounted by a casque attached at the neck. These are common, but of the other only one or two are in existence in any single community.

The paxiubas are six feet long, four inches in diameter, hollow, with a lateral aperture surrounded with leaves, which rustle when the instrument is blown through. They are painted black, and the sound they emit resembles the roaring of a bull. They are not held so important as the mantle, being kept in running water near the village, where the women must often see them. This is not spoken of, and the shamans ignore it if they chance to know it. But the sentence of death is formal on any woman who sees the

mantle. The shamans administer 'taya,' which infallibly kills the culprit, either directly or within a few weeks, or even months, a point under the control of the poisoner. Naturally the Uapé women regard Jurupary and his mantle with becoming terror, which centres about the celebrations called 'dabucuri,' at which the mantle is exhibited to the males of the community.

These occasions are prepared for by a fast of two or three days. There are six dabucuri in the year, each determined by the ripening of a certain fruit, of which an intoxicating drink is made. They come in January, February, March, May, July, and November. The ceremonies last three days, and people come from fifty miles around to attend.

The time come, the adults paint themselves with black and red, and sing monotonous and dismal chants; and the shamans perform, for those desiring such service, the marriage rites, which seem to much resemble the civil rites of European marriage.

Later all the women are sent into the forest, and watched by a keeper. At the end of an hour, after the paxiuba has been sounded by men in festal attire, two or three shamans dressed as Jurupary, and covered with the sacred mantle, with thumbs and two toes on each foot hidden, the other fingers and toes fitted with long claws like the legendary god, appear in the feast-house, jumping on all fours, and striking with a stick, right and left, blows on the spectators, which are not returned. All this takes place in perfect silence, and terminates by the disappearance of the shamans. After sounding the paxiuba for a quarter of an hour, the women are recalled. All carry rods, with which the men and women whip each other. If a white man arrives, he may be admitted provided he will consent to receive a few blows, which he may afterward return with usury. After the flagellation, the women form concentric circles, and the men a large circle, each with the right hand on the shoulder of the one in front of him. Each dancer has a shrill flute, which he sounds, and moves up and down, right and left, by action of the lips. They move with measured step, at first slowly, afterward according to their state of excitement. The dancers drink the intoxicating beverage prepared for the occasion, and soon begin to jump, gesticulate, and act as if possessed by some frenzy; the shamans calling on Jurupary to present himself, which, through them, he excuses himself from doing on the ground that the women would become changed into, or would give birth to, serpents. The dress of the dancers is at first as usual; but, as the saturnalia progresses, it is gradually dropped as inconvenient. Pro-

miscuous intercourse between the sexes follows, with intervals of flagellation and inebriety, until exhaustion or daylight closes the performance for the time.

These horrible orgies are supposed to have been directed and planned by Jurupary himself, and to represent the character of the heaven to which his faithful devotees will be translated after death. The fasts by which they are preceded are rigid and painful, well adapted to produce hallucinations and visions. Men who have adored the god will reach him after death; those who have not will lose themselves on the long and difficult way. Halfway is the abode of Bishiú, an inferior spirit, where are detained the souls of those women who have unintentionally gazed upon the sacred mantle, — a sort of purgatory, — or, according to others, they are turned into serpents or caimans. There is also an ill-defined inferno at the bottom of the earth, where the worst people bring up, after being lost on the way to heaven. Here they suffer frightfully, and are controlled by a sort of demon.

Although Coudreau rejects the idea of a civilized origin for these myths and practices, it must be allowed that there is a decided flavor of mediæval Europe in the virgin mother of the god, the sacrifice of the god himself by men, the purgatory, hell, and heaven, and even in the fasts and flagellations. It is much what might be expected from the reception at a distant period of some ill-understood and misconceived notions of Christianity, befouled, modified, and mixed with native myth; especially if we suppose that the reception of the original attempt at instruction was separated from the present time, as it must have been, if there were such, by a long period of non-intercourse with missionaries or civilization. This seems to us the most natural explanation of an isolated development, such as these myths are represented to be; and as such it would form a most interesting chapter in the history of the evolution of religions.

ANOTHER FEATURE OF THE RECENT EARTHQUAKE.

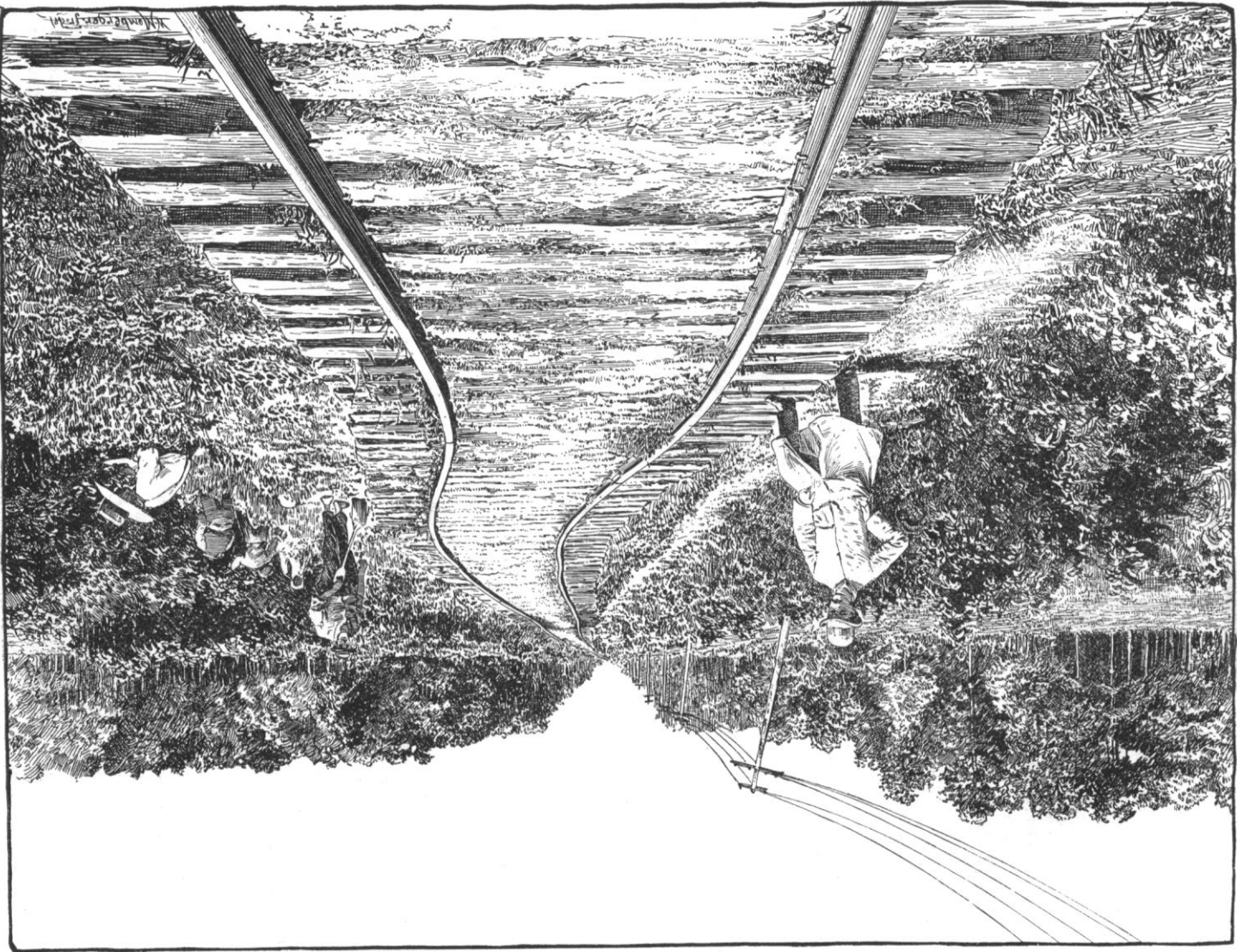
SOME remarkable features of the recent earthquake on our southern seaboard were illustrated and described in *Science* of Sept. 24. Through the kindness of the *Railroad gazette* we are enabled to present a view of the effect of the same earthquake upon a section of railroad-track. The view is an exact reproduction of a photograph taken near Ten-Mile Hill, on the South Carolina railroad, after the earthquake of Aug. 31.

According to the statements of persons familiar

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with the locality, the track at the point shown was previously straight and level; the sharp double curve in the foreground, and the abrupt change of grade in the middle distance, being wholly due to the sudden movement of the earth's surface. A press despatch from Charleston on Sept. 2, in relation to a railroad accident at a point near that shown in the engraving, states, that, at the moment the shock was felt, it seemed to those on the train that the earth had suddenly given way; that the train plunged with frightful velocity down a steep declivity, was then raised by a terrestrial undulation, and, having reached the top of the wave, was hurled down an embankment by a sudden swerving of the earth to the right and left.

In many places along the lines of the railroads near the centre of disturbance, the track had the appearance of having been alternately raised and depressed, like a line of frozen waves. The movement of the earth had also been from east to west, bending the tracks in reverse curves, many of the curves taking the shape of a single, others of a double letter S.

A train near Jedburg was running along at the usual speed, at the time of the earthquake, when it suddenly seemed to leave the track and go up into the air. This was the upward wave. It descended with equal suddenness, and as it came down it was flung violently over to the east, the wheels apparently being raised some distance from the rail on the west side of the track. Then there was a reflex action: the train righted, and was hurled violently to the west, finally subsiding to the track and taking a downward plunge, evidently the descending wave. It was afterwards found that the train had passed over one of these serpentine curves with undulating surface, and very probably at the instant the movement of the earth was taking place.

THE TIMBER OF THE ENGLISH COLONIES.

ON Oct. 8 a large number of colonial visitors, together with some of the leading civil engineers, builders, timber merchants, and others interested in the employment of timber, assembled by invitation at the Chelsea works of Messrs. A. Ransome & Co., London, in order to witness a series of practical experiments with different varieties of colonial timber at present commercially unknown in England.

After the experiments, which were conducted with more than forty different varieties of timber from India and the colonies, and comprised tree-felling, cross-cutting, sawing, planing, moulding, morticing, tenoning, and boring, while the manu-

facture of such things as casks, doors, pick-handles, carriage-spokes, and railway-sleepers, was carried to its completion, and the articles exhibited to the assembled guests, Mr. Allan Ransome opened the proceedings by announcing the conclusions at which the recent experiments had enabled him to arrive in respect to the qualities of the different varieties of colonial timber submitted to his notice. He said, that, among the forty different species, some stood out as pre-eminently suitable for the English market. There were iron bark and mountain ash, from New South Wales, both suitable for wheelwrights' work, and the former, owing to its peculiar hardness, for piles and railway-sleepers as well; black-wood, from Victoria, suitable for carriage-building, cabinet-work, and case-making; Karri-wood and Jarrah, from western Australia, both useful for joiners' work, sleepers, furniture, and piles, of which he could say that there was no fault to be found; black-pine, red-pine, totara, and kauri, from New Zealand, which could be employed for furniture, cabinet-work, house-building, and general purposes, kauri being especially useful; Douglas fir and the swamp ash, from Canada, both suitable for building, joiners' work, etc., the latter being particularly sound, strong, tough, and cheap; yellow-wood, stink-wood, and sneeze-wood, from the Cape of Good Hope, the two former species suitable for furniture, building, and joiners' work, and the latter, from its unusual durability, for piles, posts, telegraph-poles, etc.; Billian and Serayah, from British North Borneo, the former suitable for beams, piles, and every purpose where durability was necessary, and the latter for furniture, veneers, etc.; and, lastly, Padouk-wood, from India, which was suitable for joinery, carriage-building, and furniture, was exceedingly plentiful, and was grown near the coast. Many samples of wood sent had unfortunately been too small for experiment; but of those operated upon he could say that they had all been found suitable, so far as quality was concerned, for their various purposes.

The Hon. Malcolm Frazer (western Australia) said, that, of the Karri and Jarrah timbers, there was a considerable supply in London at the present moment. Large quantities of several hundred loads of these species might be obtained at £7 per load, or in smaller quantities at a slightly higher price. Their cost was only half that of teak.

Prof. P. L. Simmonds (New Zealand) said that New Zealand produced a vast number of ornamental woods, as well as many useful ones. In the latter line, however, the colonists of New Zealand would not be able to compete with other

colonies in the home market, partly because of the local demand for their woods, and partly because the cost of carriage would be too great.

Professor Macoum (Canada) said that the reason the English merchant knew so few of the Canadian timbers was the natural indisposition existing in both countries to take a new departure from old habits. The Douglas fir of Canada was fully equal to the white-pine now employed, and when the supplies of the latter were exhausted, the former would of necessity take its place. The Douglas fir grew in vast quantities, attained a great height, and tapered very gradually. In their black-ash, too, the Canadians possessed a species of timber which would some day be very widely employed, for it had all the qualities of the now favorite white-ash, and its supply was unlimited. The Douglas fir could be supplied in England at £5 a load, and the black-ash at the same price as elm or white-pine.

Mr. E. A. Cooper (the Cape) said that the um-zumbit of that colony was, from its remarkable hardness and durability, a very desirable wood, offering more resistance to wear and tear than *lignum vitae* itself, and being impervious to the attacks of the teredos. The Cape yellow-wood could be supplied as cheaply as any, the price being about £6 10s. a load. The stink-wood, however, which was very useful for furniture, could not find a market here, owing to the high prices it commanded in the colony; namely, 3s. to 4s. a cube.

Mr. Alfred Dent (British North Borneo) said that the Billian of that country offered great attractions to the English merchant. It grew in enormous quantities, was very easy of access, and exceedingly hard and durable. Companies were wanted to undertake the supply of the wood in large quantities, at present an impossibility. As to the cost of the wood, he remarked that one firm already was prepared to supply it alongsideship at £3 10s. per ton, a price which freightage, etc., would probably increase by about fifty per cent. But competition would, no doubt, reduce these charges considerably.

THE PEOPLE ON THE KONGO.

WALCKE, on his return from five years on the Kongo, has given some interesting details in regard to the people of its banks. Those of the lower river have been brutalized by the importation of liquor, and form a strong contrast with the people of the interior, who have so far escaped such demoralization. On the upper river the Bassunde are the first people who

dress their hair. It is noted that those tribes who neglect their hair are deficient in physical and moral qualities. With the Bassunde it takes several hours to perform the toilet. They are polygamous, the wives living in pairs in little huts grouped around the principal house, where the head of the family resides. Marriage is simply a matter of bargain and sale. The number of wives in some sort gauges the importance of the husband. They have no ceremony in connection with marriage or birth, but a funeral is the occasion of much display. It is fortunate for the traders that these people, who wear hardly any thing but a breech-clout in life, when dead consume immense quantities of cloth. A man who has not worn twenty yards of cloth in his whole life will be rolled in four hundred yards to be buried.

When a death occurs, the body is energetically washed, half the village joining in the work with loud cries and howls, and distribution of rum. The body is put in a sitting posture, and painted red. The chief depressions are then stuffed out with dead leaves, and the whole is rolled with cloth into a cylindrical bale. The process goes on sometimes for three months, as the body is not put under ground until all the dead man's estate is exhausted in the purchase of material. Meanwhile it is placed in a specially constructed hut. The bigger the bale, the greater the dead man's credit; so that, in case of a chief, the people of the village will sometimes contribute to enlarge his wrappings. Finally the bale is wrapped in a particularly fine piece reserved for the purpose, and is carried in triumph about the village, and then buried with salvos of musketry, which, if the powder holds out, are repeated nightly over the grave for some time. As usual among the negroes, the death is always ascribed to sorcery, any one suspected being obliged to undergo the ordeal of drinking a certain preparation. If within a certain time the suspect is overcome by the effects of the draught, he is put to death as a murderer. The cult of the people is pure fetishism: they have a fetich for each sort of danger to which they may be by chance exposed,—one for serpents, one for crocodiles, etc. A native, being told that he must be happy at being safe from crocodiles, replied, 'Not at all: the fetich loses its power when brought near water.' They appear to serve merely as a sort of reminder what dangers are to be avoided.

They have certain medicaments which are of real efficacy, as against fevers, but will not reveal their nature: for the rest, diseases are treated by conjuration. Circumcision and excision of the clitoris are practised, and admit the patient to the privileges of maturity, as one of the tribe. They

are performed with a good deal of ceremony. If by any chance either operation is not performed, the individual could not obtain a partner in marriage, and would be avoided as uncanny. Besides individual fetiches, there are those which belong to the village. If by any means a European is robbed, he goes to the chief and gets him to beat or abuse the village fetich, which can usually be accomplished by diplomacy. The fetich is accordingly ceremoniously beaten: and the culprit, fearing retribution, soon finds means to return the spoil, and thus avert the wrath of the fetich, which might otherwise be visited on himself. They have also an ill-defined belief in some power of which the fetiches are merely the servants. This is called 'zambic,' but is supposed to be above any personal interest in human affairs.

The trade in ivory is the principal business, and is carried on chiefly by the Bateke as intermediaries between the interior and river tribes. The Batekes are not agriculturalists, but the division of labor between the sexes is more even than between those of the other peoples. Another race is found along the banks, who cultivate the soil, and furnish the Bateke with provisions in trade. These are the Bonbundos. Their habits are much like the other tribes. The Buenses are especially navigators, and make long canoe voyages in search of ivory. The Bangalas are cannibals, and wear ornaments of human phalanges. Their victims are always prisoners of war, for whom they go on hunting expeditions. From Bengala to Buensé, the most interior point reached by the traders, the most numerous tribe is the Basuco. Most of the tribes mentioned wear more or less clothing, at least a waistcloth; but among the Basucos only the men wear any thing. They have the practice of human sacrifices. A certain number of slaves are designated to be put to death at the obsequies of any chief. The idea seems to be that their fidelity for life is thus insured, since their own life depends on that of the master.

The traders do their best, and to some extent have succeeded in ameliorating these customs. Progress is pacific, and force never resorted to. The friendship of the blacks is necessary for the maintenance of their business. The negro is lazy and childish; but, treated with fairness, he does the work required of him, and which would be impossible for whites to perform in that climate. Two hundred and eighty-four special agreements have been made with different chiefs, some of whom control only twenty or thirty men. The process is tedious, but each one gained over is one friend more for the trader, and they cannot be dispensed with.

EVOLUTION VERSUS INVOLUTION.

THE growing acceptance of the theory of evolution has led in the last few years to the publication of a large number of books upon the subject, of a more or less popular nature. These are not, as a rule, scientific arguments, for science no longer considers it worth while to discuss a question now so universally accepted. From various stand-points the subject is treated. Now we find a review of its scientific aspects, now of its relation to theology, and now of its metaphysical content. The present book has three objects: it is "a popular exposition of the doctrines of true evolution, a refutation of the theories of Herbert Spencer, and a vindication of theism." In pursuance of the first object, the author gives us an historical review of the question from the time of the Greek philosophers, and then very cursorily reviews the application of the general theory to the development of worlds, of life, of the organic kingdoms, of mind and soul, and of society in its various phases. In this brief summary the evolution theory is accepted in its fullest extent as applying universally. The review is a very hurried one, however, only touching upon a few of the salient points, and recognizing no difficulties in the way of the onward tendency of thought. It would, indeed, hardly give one who was not already acquainted with the subject a very comprehensive idea of the theory of evolution, or the reasons for accepting it. In some parts it is somewhat strained; as, for instance, where a detailed comparison is drawn between the vertebrates, the mollusks and annulosa, the coelenterata, the sponges and protozoa, on the one hand, and the exogens, the endogens, the acrogens, and the fungi and lichens, on the other.

This part of the book, however, though taking up the most space, is secondary to the other two objects running through the whole; viz., the vindication of theism, and the refutation of Spencer. As a vindication of theism, the book is an illustration of the growing conception that evolution is not at all out of harmony with theism. The question of evolution is one which deals entirely with secondary causes, and even Spencer's theory does not attempt to fathom the first cause; while theism deals primarily with first cause. It is fortunate for true science and true theism that this is becoming so fully recognized, — for science, because it removes the feeling of hostility which has been accustomed to be raised in the minds of most people by the simple word 'evolution;' for theism, because it no longer makes it necessary to try to disprove this growing theory of science.

Evolution versus involution. By A. Z. BRED. New York, Pott, 1885. 8°.

That there is no contradiction between theism and evolution our author clearly shows. But he goes even further than this, and claims to prove that evolution is radically inconsistent with atheism. He thinks that the two thoughts, when carried to legitimate extremes, lead to suicidal contradictions; leading, in fact, to the extremes of Comp-tism, and its necessary worship of human nature as the loftiest thing in existence. Now, whatever may be said of this discussion, it is plain that the reader's judgment of this part of the work will depend largely upon his willingness to accept the conclusion. If he reads with a predisposition against the conclusion, the whole argument will be regarded with the same indifference as are all other arguments which try to prove the existence of God. But if he reads, accepting the conclusion, and wishing to find a justification for a belief in theism, he will be abundantly satisfied; for the arguments are keen and forcible, and plainly show that theism is exalted by the conceptions of evolution.

In his attempt to refute Spencer, our author has not been quite so successful. To refute such a system of philosophy as that of Spencer is as difficult as to demonstrate it. It may be easy to criticise Spencer, to show his false deductions and an amount of inconsistency in his writings. This our author has succeeded in doing well enough. But to refute his philosophy is a different matter. An examination of this criticism shows that it is chiefly upon Spencer's ideas of primal cause, and therefore upon his conception of the significance of law, and not at all upon his theory as to the development of the visible universe. Our author first shows that Spencer's philosophy is one of involution, and not evolution,—a fact which Spencer himself recognized. Our author gives a definition of evolution which completely reverses that of Spencer. He makes it a passage from the complex to the simple, rather than from the simple to the complex. What he means by this is not that nature has not seemed to grow more complex, but that this growth has been only the unfolding of forces and tendencies which have existed from the beginning. Evolution is therefore a revealing of that which is hidden, and is thus really a simplification. An egg is more complex than the adult, since, though seemingly simple, it contains in a small space, in addition to that which we can see, forces and tendencies which regulate the growth of the adult. Its development is simply the unfolding of this potentiality. And so the original nebula was really infinitely complex, since it contained in its laws and tendencies the possibility of the system which has arisen from it. This, our author claims, is in direct contradiction

to Spencer's philosophy of a passage from the simple to the complex, and this philosophy is therefore false at its foundation. It is a restatement of the old saying that evolution cannot exceed involution. Now, in reality, our author and Spencer do not disagree so much as at first seems. Spencer has only attempted to explain the visible universe by his philosophy, recognizing his inability to explain or comprehend law. In the visible universe there has undoubtedly been an increase in complexity. Spencer would not for an instant deny that the original nebula contained in its laws and tendencies the potential system. The difference between our author and Spencer is thus only in their metaphysical conception of the significance of these laws and their relation to the first cause which lies beneath them. It is the difference between theism and agnosticism again. Spencer regards the universe as without design: our author regards the working of law as the unfolding of a plan. Spencer looks upon the seeming design in nature as resulting from the natural working of law, without attempting to go beneath this statement: our author goes a step further, and puts the plan in the nature of the laws themselves. These two positions are not necessarily contradictory, though when regarded in certain lights they may be so.

This discussion of Mr. Rred's is therefore valuable as an exposition of the meaning of theistic evolution. It shows that theistic evolution is consistent with all the facts of science, and that the law of evolution, when viewed from the theistic stand-point, contains a significance which is utterly wanting to it when regarded from the stand-point of atheism. But as a refutation of Spencer it is hardly a success; for it has only shown that the conception of Spencer's Unknowable as an intelligent personality is preferable to the agnostic position of Spencer.

TWO SCHOOL-BOOKS ON GEOLOGY.

THERE can hardly be found a greater contrast in the methods of treatment of a subject than is presented by a comparison of the school-books on geology lately prepared by Professors Geikie and Winchell. The authors seem to have had scholars of about the same high-school age in mind. Their objects are similar,—for one makes 'an appeal to the powers of observation,' and the other wishes 'to foster a habit of observation,'—and yet how different are their paths to this common end! Professor Winchell begins, after advising teachers

Class-book of geology. By ARCHIBALD GEIKIE. London, Macmillan, 1886. 8°.

Geological studies; or, Elements of geology. By ALEXANDER WINCHELL. Chicago, Griggs, 1886. 8°.

to 'adhere scrupulously to the *method* of the book,' with so complex and difficult a formation as the drift, collects specimens from it, tells a little about chemistry, more about minerals and rocks, describes eruptive rocks before considering eruptions, briefly discusses sedimentation and erosion, describes geological maps and sections, and so on through the first part of his book, the outcome of which may very likely be, as he suggests, "a somewhat chaotic and undigested mass of facts and doctrines, buried in a considerable volume of verbiage." Then follows part ii., attempting to give as a complement to the first a methodical representation of what has already been encountered, but in extremely condensed form. So fundamental a matter as cycles of sedimentation are quickly passed over, with very brief illustration; and even the lesson of unconformability is given little emphasis, although more than four pages are devoted to the recent theories of ancient tides and tidal action. Altogether too much is attempted under the heading of formational geology, considering the small space allowed it: much of this might be omitted to the advantage of the rest, as the book is not intended for a manual. But the greatest difficulty seems to be that the book tries to take the place of the teacher. For example: on p. 128 we read, "You ought to take a great deal of exercise on the geological map, and especially in the construction of sections, no matter if it requires two or three days to finish one study." Any teacher whose instruction needs to be supplemented by such dictation as this can hardly be expected to have ability enough to use and explain the rest of the book properly; and certainly no teacher of independence and originality can wish to have questions of method so minutely defined for him by some one else. In the hands of the author, with the inspiration of his enthusiasm and knowledge before the class, such instructions may serve a purpose; but inspiration in teaching is seldom transmitted through the medium of printer's ink.

The plan of Professor Geikie's book is preferable, because, while it gives a simple, attractive presentation of facts, arranged in a very natural order, it leaves the teacher free, if he desire to arrange a course for himself, to plan his own method on minor points, and gain inspiration with originality; or, on the other hand, it provides chapters that can be read with entertainment and used as bases for set recitations, if the teacher is satisfied, or is obliged merely to follow a book. The physical chapters run about as follows: action of atmosphere and water, effects of lakes and springs, ice and the sea, fossils, volcanoes, and earthquakes. Then come minerals and rocks; rock-structures, original and secondary; and, finally, the historical

view, occupying a third of the book. The proportion is somewhat less in Professor Winchell's book: it might be in both still further reduced to the advantage of the class of students addressed, for the first view of historical geology is too much encumbered with meaningless fact to develop thought or to train the understanding. Instead of reviewing in condensed form the whole column from archæan to present, the student would learn more from the deliberate description, illustration, and discussion of a small part of it, which might then serve as a key to the understanding of the rest in later years of study.

The illustrations are, as a rule, better in the English than in the American book, though the latter are good, on the whole. The only bad picture that has Professor Geikie's tacit approval is his fig. 10, that tries to represent torrent-cut gullies on a mountain-side: it has the 'made-to-order' look. The vertical exaggeration allowed in the sections is the most serious defect in the illustration of Professor Winchell's book: it is true that these are generally copied from venerable state reports, and have authoritative names to justify their use, but they are bad, for all that. No proper idea of the geological structure of Tennessee can be gained from the section on p. 93; and the original section across Michigan, p. 126, might well be labored over to bring it somewhat nearer the true scale, no matter if it required two or three days to finish it.

THE annual report of the commissioner of pensions for the fiscal year ending June 30, 1886, shows the vast extent of our pension system. At the close of the year there were on the rolls 365,783 pensioners, of whom 265,854 are classified as army invalids; 80,162 as army widows, minor children, and dependent relatives; 2,953 as navy invalids; 1,878 as navy widows, minor children, and dependent relatives; 1,539 as survivors of the war of 1812; and 13,397 as widows of those who served in that war. 1,406 survivors of the war of 1812, and 3,815 widows of soldiers of that war, died during the year. 40,857 new pensioners were added to the roll during the year, and 2,229 whose pensions had been dropped were re-instated. As 22,089 were dropped for various causes, the net increase was 20,658. The average annual value of each pension is \$122.23, and the aggregate annual value amounts to \$44,708,041.51. The amount paid during the year, including the arrearages, was \$63,797,831.61. In all but 118 of the 2,647 counties in the United States, pensions are being paid, and 1,691 pensions are paid in 35 foreign countries. Verily, republics are not always ungrateful.